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ABSTRACT

The purpose of this study was to investigate the use of IQ as a measure of learning rate with children of similar ethnic origin but different socioeconomic backgrounds. The theoretical basis for this experiment was Jensen and Rohwer's distinction between developmental rate and learning rate. Specifically, a dimension abstracted oddity task was presented to 180 Mexican-American children with different IQs from lower and middle socioeconomic backgrounds. They were matched on MA. The results support the Jensen and Rohwer hypothesis as IQ was found to determine the rate of learning the task. Also, middle-SES children learned the task faster than their low-SES peers. (Author)

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THE USE OF IQ AS A MEASURE OF LEARNING RATE WITH MINORITY CHILDREN

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ABSTRACT

The purpose of this study was to investigate the use of IQ as a measure of learning rate with children of similar ethnic origin but different socioeconomic backgrounds. The theoretical basis for this experiment was Jensen and Rohwer's distinction between developmental rate and learning rate. Specifically, a dimension-abstracted oddity task was presented to 180 Mexican-American children with different IQs from lower and middle socioeconomic backgrounds. They were matched on MA. The results support the Jensen and Rohwer hypothesis as IQ was found to determine the rate of learning the task. Also, middle-SES children learned the task faster than their low-SES peers.

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THE USE OF IQ AS A MEASURE OF LEARNING RATE WITH MINORITY CHILDREN

Marvin L. Schroth
Santa Clara University

Psychologists for many years have debated the proper usage of intelligence tests in the educational setting and the theoretical implications of MA (mental age) and IQ (the relationship of MA to chronological age). Contemporary concern centers around the affects of cultural deprivation and ethnic group membership on the above concepts of intelligence testing and their relationship to ability to learn.

It is well known, as summarized by Hess and Shipman (1965), that children from deprived cultural backgrounds score well below middle-class children on standard individual and group measures of intelligence. However, it is not so easy to conceptualize the true meanings of IQ and MA, in themselves, let alone when children of different ethnic and socioeconomic backgrounds are involved.

One hypothesis is expressed by Zigler (1967b) as part of his theoretical position on mental retardation; he states that it is the MA and not the IQ which determines the rate of learning any task. Thus, two persons of different chronological age (CA) and different IQ, but matched on MA, should show similar learning rates.

An opposing theory has been put forth by Weir (1967). He maintains that, if MA is a measure of the knowledge an individual has accumulated by a given CA, the rate of acquisition of this knowledge is represented by the IQ which is MA/CA x 100. Therefore, contrary to Zigler's position, persons of the same MA but differing in IQ should show different rates of learning on all learning tasks.

Jensen and Rohwer (1968) attempt to clarify the theoretical disagreement between Zigler and Weir by making a conceptually clear-cut distinction between developmental rate and learning rate. Mental abilities have a hierarchical structure which follows a chronological sequence as demonstrated by White (1965). This developmental sequence is marked by the increasing complexity of the cognitive structures which children can bring to bear on solving problems. The ages at which individuals attain these stages of cognitive development are regarded as indices of developmental rate. However, two individuals who are at the same developmental stage may still differ in the rates at which they can acquire new information, distinguished as learning rate. Children can be retarded or normal in developmental rate and retarded or normal in learning rate. Therefore, Jensen and Rohwer's two x two formulation suggests three possible combinations of familial retardates; both normal developmental rate and normal learning rate are necessary for the manifestation of normal intelligence.

A major objective of the present study is to determine the relationship of MA and IQ to learning rate on a task which involves concepts. Specifically, a dimension-abstracted oddity problem was presented to Mexican-American children with different IQs, but matched on MA. These children were selected as subjects because it is generally accepted that intelligence tests are biased against different ethnic groups since they include items such as general information and vocabulary, which Mexican-Americans may not have had a chance to learn. Consequently, their learning rate may be considerably higher than their developmental rate. A second major objective of this proposed study is to investigate the affects of different socioeconomic backgrounds of children within this ethnic group. Rapier (1968) found that the relationship between learning rate and MA is complicated by socioeconomic status (SES). He matched mildly retarded Caucasian middle and low-SES children on IQ, MA and CA. The low-SES children showed consistently and significantly faster rates of paired-associate learning than the middle-SES children.

Method

Subjects.-- One hundred and eighty Mexican-American children (grades 1-4) from the Whisman School District, Mountain View, California, served as subjects. All groups were matched on sex, MA, and assigned to each of 12 groups.

The grade and sex distribution of the sample was as follows: first grade, 28 males and 25 females; second grade, 22 males and 20 females; third grade, 20 males and 24 females; 4th grade, 20 males and 21 females. The median IQ for subjects was 94; an equal number of middle and low SES subjects were included in the sample.

There are six elementary schools within this district which vary in terms of the socioeconomic background of the subjects. Twenty % of the students are Mexican-American.

Stimuli.--The stimuli used in the proposed study were three sets of 12 "metric" shapes to be constructed by a technique developed by Fitts, Weinstein, Rappaport, Anderson and Leonard (1956), as described below. These stimuli were applicable for the experiment in that their use eliminated the variable of past experience as a factor in connection with the stimulus-aspects of the oddity task.

Set One.--Beginning with an 8 X 8 matrix, a pair of prototype nonsense shapes were selected, with the number of cells to be filled in each column of the matrix randomly determined. However, the shapes were designed so that each column in the individual metric forms was of dissimilar height.

There followed a systematic derivation of two "families" of shapes from the initial prototype forms. The height of each column in the new shapes was derived by elevating or lowering the column of a single space from the corresponding column in the prototype shape according to the flip of a coin. In this fashion, 11 shapes were created from the prototypes. The size of the individual shapes were 3.3" X 3.3".

The final step consisted of drawing the metric figures in black ink on 12 6 1/2" X 14" pieces of cardboard. Although all three figures on a given card are of the same size, two (derived from the prototype shape) were identical in shape; the third (derived from the second prototype form) was different. Each of the trio of figures on a particular card were equidistant and, through a systematic arrangement, the odd shape appeared an equal number of times in each position in the set of 12 cards.

Set Two.--The same method was used in constructing the second set of stimuli, except a second dimension of size was added to increase the complexity of the oddity task. The following sizes of the individual shapes were as follows:

(1) 4" x 4", (2) 3.3" x 3.3", (3) 2.6" x 2.6", and (4) 1.9" x 1.9".

The final step was sketching the metric forms in black ink on a dozen 6 1/2" x 14" pieces of cardboard. Each of the trio of figures on a particular card was equidistant; however, only two of the figures (derived from the first prototype shape) were identical in shape and all were of dissimilar size. All four sizes appeared in each of the three positions three times in the set of 12 cards, with the odd shape appearing in each position four times.

Set Three.--Construction of the third set of stimuli proceeded along the same lines as the second set except another dimension was added, color, to the dimensions of size and shape. Thus, these figures were even more complex as all "metric" shapes on a stimulus card consisted of a different color (red, blue or yellow) and size. Two of the figures, however, were identical in shape, with the odd shape, three colors, and four sizes appearing an equal number of times in each position in the set of 12 cards.

Instruments

1. Assessment of intellectual ability. The Otis Quick-Scoring Alpha (OQSA) was administered to subjects to determine intellectual ability. It is recognized by both Anastasi (1968) and Shuey (1966) as an excellent group test as it correlates highly with other intelligence tests.

2. Assessment of SES status. Duncan's (Ringless, 1970) method for assessing SES on the basis of father's occupation was used. This index reflects prestige of occupation and is partly based on education.

Design

A factorial design was employed which involved two levels of IQ, two levels of socioeconomic status and three levels of task complexity (Table 1). The various levels within the different experimental conditions are as follows: IQ = Median+ (Subjects above the median for all subjects on the intelligence test) and Median- (Subjects below the median for all subjects on the intelligence test); socioeconomic status = middle- and low-SES; task complexity = problems containing 0, 1, or 2 irrelevant dimensions. All groups were matched on MA and, in addition, the low- and middle-SES groups were matched on IQ.

Table 1
Experimental Design

Median+		Median-	
Low-SES	Middle-SES	Low-SES	Middle-SES
Levels	Levels	Levels	Levels
1 2 3	1 2 3	1 2 3	1 2 3

Procedure

The subjects in all groups were introduced individually to the oddity problem by the following instructions both in English and Spanish:

> We are going to play a game. It may be a new game for you. I will show you three figures on a card, and you must choose one. The object of the game is to find the correct figure on each card. Every time you point to the correct figure, a poker chip will be placed behind it. In order to know which is the correct figure on each card, you must look at all three very carefully, compare them, then choose one. Now do you know how to play? Remember, you must look at all three figures very carefully, compare them, and then pick the one you think is correct.

The experiment consisted of 48 trials (the presentation of a card displaying three figures represented a single trial) or number of trials required to reach the criterion of 9 out of 10 successive correct responses. A correct response consisted of choosing the figure that was odd in shape. In order to minimize possible trial-order effects, the identical order of presentation was maintained for subjects within all groups. Feedback or knowledge of results, as indicated in the above instructions to subjects, was provided on each trial by a poker chip which was placed immediately behind the correct figure.

Results and Discussion

Table 2 shows the mean number of trials to reach the criterion of nine out of ten successive correct responses for the 12 groups on the dimension-abstracted oddity task. A three-way analysis of variance, with IQ, SES and task complexity as factors, resulted in significant Fs (1,168) of 4.21, 4.88 (both ps < .05) and 27.65 (p .01), respectively. The three second-order interactions were insignificant: IQ x SES, F (1,168) = .82; IQ x Task Complexity, F (2,168) = .73; and SEC x Task Complexity, F (2,168) = .97. The third-order interaction was also found to be insignificant with a F (2,168) of less than one.

Table 2
Mean Number of Trials to Criterion
as a Function of IQ, SES and Task Complexity

Task Complexity	Median+ IQ		Median- IQ	
	Low-SES	High-SES	Low-SES	High-SES
Level One	14.53	11.24	16.55	14.55
Level Two	21.71	18.55	20.11	20.91
Level Three	27.29	22.81	29.51	23.12

Further comparisons on treatment means were carried out by the use of Scheffe's test (Edwards, 1968). All of the following effects that are reported are significant at the .01 level. As expected, groups with the one-dimension oddity task solved the problem significantly faster than groups with the two-dimension oddity task, F (1,168) = 24.07 and groups with three-dimension task, F (1,168) = 32.41. Finally, the "two-dimension" groups took significantly fewer trials to solve the task than the "three-dimension" groups, F (1,168) = 26.03.

The results of the present experiment support Wier's (1967) theory that IQ, and not MA, determines the rate of learning a task as opposed to Zigler's (1967b) hypothesis. In addition, these findings, concerning the superiority of the Median+ IQ groups over the Median- IQ groups in learning the dimension-abstracted oddity task, are in agreement with previously reported studies in regard to Jensen and Rohwer's (1968) distinction between learning rate and developmental rate. Jensen (1965) reported that normal children, matched on MA with mentally re-

tarded young adults, had learning rates some three to four times faster on paired-associate and serial learning tasks than the latter subjects. Rohwer (1967) compared institutionalized familially retarded adults with groups of normal children in Head Start and Kindergarten and in Grades One, Three and Six on paired-associate learning. The results of the experiment showed the average learning score of the retardates to be significantly lower than that of the other groups, as well as being significantly lower than all other groups combined. Consequently, the results of these experiments and the present study suggest that equivalence of developmental level, as expressed by MA, should not imply equality of performance on intellectual tasks. This interpretation applies to Mexican-American subjects as well as Anglo-Americans.

The findings in regard to SES and problem-solving are equally significant theoretically. The fact that the middle-SES subjects did significantly better than their low-SES peers, matched on IQ and MA, establishes the importance of motivational variables in learning. It lends support to the viewpoint that one major reason children from middle-class backgrounds typically do better in school than children from lower-class backgrounds is because the formers' parents extablish a better climate for learning in the home (Johnson and Medinnus, 1969)! They tend to stress educational achievement and instill these values in their children. The current results suggest that this hypothesis is valid for Mexican-Americans as well as Anglo-Americans.

Conclusions

The results of this experiment support Wier's (1967) theory that IQ, and not MA, determines the rate of learning a task as opposed to Zigler's (1967a; 1967b) hypothesis. Furthermore, these findings, concerning the superiority of the Median+ IQ groups over the Median- IQ groups in learning the dimension-abstracted oddity task are in agreement with Jensen and Rohwer's (1968) distinction between learning rate and developmental rate. Consequently, the results of the present study suggest that equivalence of developmental level, as expressed by MA, should not imply equal ability to solve various intellectual tasks. These conclusions concerning the proper interpretation and usuage of IQ and MA apply to Mexican-American subjects as well as Anglo-Americans.

The results, in regard to SES and problem-solving are equally significant theoretically. The fact that the middle-SES Mexican-American subjects learned the dimension-abstracted oddity task significantly faster than their low-SES peers, matched on IQ and MA, establishes the importance of motivation in problem-solving. It lends support to the viewpoint that one major reason children from middle-class environments typically do better in school than children from lower-class backgrounds is because their parents stress the importance of learning.

For example, they tend to stress educational achievement and instill these values in their children. The results of the present experiment, hence, suggest that this hypothesis is valid for Mexican-Americans as has previously been discovered with Anglo-Americans.

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